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Juhola, Sirkku

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RESEARCH ARTICLE

Participatory experimentation on a climate street

Sirkku Juhola[1] | Antti Seppälä[2,3] | Johannes Klein[3,4]

[1]Ecosystems and Environment Research Programme, Helsinki Institute of Sustainability Science (HELSUS), University of Helsinki, Helsinki, Finland

[2]Department of Environmental Sciences, University of Helsinki, Helsinki, Finland

[3]Department of Built Environment, Aalto University, Espoo, Finland

[4]Environmental Solutions Unit, Geological Survey of Finland, Espoo, Finland

Correspondence
Sirkku Juhola, Ecosystems and Environment Research Programme, Helsinki Institute of Sustainability Science (HELSUS), University of Helsinki, PO Box 65, FI-00014 Helsinki, Finland.
Email: sirkku.juhola@helsinki.fi

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Abstract

Cities' role in addressing both climate change mitigation and adaptation is becoming increasingly important. Within the last decade, cities together with other actors have initiated neighborhood-level climate change projects that build on the concept of experimentation using participation and coproduction. Common features in these initiatives are the limitation of the project to a geographically specific area within the city, inclusion of stakeholders from that physical location, and the use of different types of experimentation through participation in order to pursue climate objectives. This qualitative case study discusses the participatory experimentation and potential structural transformations by focusing on the Climate Street project of Helsinki and Vantaa, Finland. More specifically, we examine how learning, participation, and public visibility contribute toward the impact of the project. Our results show that existing urban governance structures restrict experiments in many ways and only certain types of change are feasible. This implies that while participatory experimentation offers promise but is not a panacea in terms of governing climate change.

KEYWORDS

climate change, climate street, experimentation, urban governance

1 | INTRODUCTION

Cities' role in addressing both climate change mitigation and adaptation is becoming increasingly important (Corfee-Merlot, Cochran, Hallegatte, & Teasdale, 2011; Dent, Bale, Wadud, & Voss, 2016; McPhearson et al., 2016; Measham et al., 2011). This is manifested not only in the mitigation targets and adaptation goals that the cities outline for themselves through public sector strategies but also in increasing forms of participation of different actors in urban climate governance. This has resulted in a proliferation of new forms of policy and governance arrangements that cut across scales, engaging national and local actors in the same networks (Bulkeley, Castán Broto, & Maassen, 2011; Gollagher & Hartz-Karp, 2013; Hausknost et al., 2018; Knieling, 2016). Many of these initiatives cut across multiple scales, which can result in conflicts or synergies (Landauer, Juhola, & Klein, 2019), but, there is a gap in the empirical literature in terms of their impact so far (Wolfram, van der Heijden, Juhola, & Patterson, 2019).

More recently, cities together with other actors have initiated a number of neighborhood-level climate change projects that build on the concepts of experimentation, participation, and coproduction and engagement of the civil society (Aiken, 2018; Ruggiero, Martiskainen, & Onkila, 2018). These projects are often labeled as "Climate-Street" or "Climate-Quarter" and aimed not only at fostering ecologically sustainable development and reduced greenhouse gas emissions but also at creating new economic potential and an improved living environment. These kinds of initiatives can be found, for example, in Amsterdam, Cologne, Copenhagen, Fredriksberg, Helsinki, and Vantaa (Seppälä, Haanpää, Klein, & Juhola, 2017). Common features in all these initiatives are the limitation of the project to a

geographically specific urban area, inclusion of stakeholders from that area and the use of different types of experimentation through participation in order to pursue climate objectives (Kivimaa, Hildén, Huitema, Jordan, & Newig, 2017). However, there is little information about how place specificity and geography affect transitions (Hansen & Coenen, 2015). On the surface, these types of projects support participation and the overall goals of inclusive urban climate governance, but their impact has largely gone under-researched, and there is a need to understand what kind of impact they have (Forrest & Wiek, 2014).

This qualitative interview-based case study addresses this lack of empirical knowledge by focusing on the Climate Street project of Helsinki and Vantaa in Finland. We examine how participatory experimentation takes place in an existing urban fabric and how it may contribute to transformations within the city governance structures. More specifically, we examine what type of learning, participation, and the creation of public debate took place within the Climate Street project. The data are based on participant observation, as well as several interview rounds and questionnaires during the project period, which are analyzed according to a thematic framework that focuses on testing, learning, and participation.

Our results show that existing governance structures restrict experiments in many ways and only certain types of change succeed, indicating that some types of changes are possible but not all. The experiments of the project triggered some practical changes for citizens and local companies, where participation of stakeholders was successful. However, experiments that entail a change of existing infrastructure or physical environment faced often unavoidable barriers because of the strong interlock of the physical environment and existing governance structures. The consequences of this interlock are twofold. First, the restricted already built-up space for experimentation limited the possibilities for the introduction of new technologies to increase economic potential and improve the living environment. Second, although the project offered a platform for participation, its detectible input to the project goals remained sparse, because jointly developed concepts and ideas could not be pursued any further within the limited project lifetime.

2 | BACKGROUND AND ANALYTICAL FRAMEWORK

2.1 | Background

The role of cities in governing climate change, both mitigation (Dent et al., 2016) and adaptation (Measham et al., 2011), has become of increasing interest in the last 10 years. It has been argued that in addition to intergovernmental efforts by nation states, cities themselves have become global actors, making significant efforts in implementing climate change policies (Bulkeley, 2005), thus potentially making a significant contribution to the implementation of international GHG reduction targets.

Focus on environmental governance (Jordan, Wurzel, & Zito, 2005) and urban governance has been in understanding the move toward more diverse forms of decision making (Bos, Brown, Farrelly, & De Haan, 2013). In a broad sense, governance can be seen as "every mode of political steering involving public and private actors, including traditional modes of government and different types of steering from hierarchical imposition to sheer information measures" (Héritier, 2001, p. 2). The most recent development on this continuum can be seen to be the emergence of experimentation as a way of implementing policy (Haughton, Allmendinger, & Oosterlynck, 2013; Lockwood, Davidson, Curtis, Stratford, & Griffith, 2010), emerging alongside other modes. Experimentation has been particularly popular when it comes to climate change governance (Anguelovski & Carmin, 2011; Meijerink & Stiller, 2013; Sengers, Wieczorek, & Raven, 2016; Wellstead, Howlett, Nair, & Rayner, 2016), and energy efficiency and sustainability initiatives (Hilden et al., 2017; Weiland, Bleicher, Polzin, Rauschmayer, & Rode, 2017; Jalas et al., 2017).

Alongside the more established patterns of governing activities (Kooiman, 1993), experimentation has become to mean activities that challenge the status quo to allow for new ways of innovation, technologies and services in a limited temporal and spatial scales (Chu, 2016; Kivimaa et al., 2017; Munthe-Kaas, 2014), which can be led by public authorities at the national and local levels. Particularly popular in the urban context, experiments can be considered as a means through which policies become diffused, changing structures of authority and opportunities of effecting change and knowledge of cities (Bulkeley and Castán Broto, 2013). Key features of experiments are new stakeholder interactions, instruments, and arrangements that are used to test and assess performance over a limited period of time that can then be used for wider replication and upscaling (Castán Broto & Bulkeley, 2013; Evans, Karvonen, & Raven, 2016).

The most recent scholarship on experimentation has so far been focused on two aspects. First, as stated by Bulkeley and Castán Broto, although the phenomenon of urban climate experimentation has been observed on many continents, there is little sense of how it is spreading globally (Broto & Bulkeley, 2013). These questions have been asked by collection of global databases that attempt to capture the emerging experimentation to analyze key components of it and its dynamics (Castán Broto & Bulkeley, 2013). In addition, there are a number of reviews of existing literature that aim to contribute to a consolidation of concepts and outlining of research agendas (Kivimaa et al., 2017; Sengers et al., 2016; Voytenko, McCormick, Evans, & Schliwa, 2016).

A second strand of literature can be seen to be composed of individual case studies, focusing on a particular experiment in specific locations (Bai et al., 2010; Boyd & Ghosh, 2013; Chu, 2016; Cloutier et al., 2015; Uyarra & Gee, 2013; Ruggiero et al., 2018). These kinds of case studies generally show how particular mitigation or adaptation focused experiments take place, why they are taking place and who takes part in it, with an emphasis on solving every day sustainability challenges in the urban context (McCormick, Neij, Anderberg, & Coenen, 2013; Munthe-Kaas, 2014). This participatory experimentation is defined here as initiatives that engage a variety of stakeholders

in the design, implementation, or dissemination phases with an explicit purpose to test solutions to a contextually explicit problem.

In particular, this type of experimentation in the urban context has been conceptualized as urban living labs or transition labs (Nevens, Frantzeskaki, Gorissen, & Loorbach, 2013; Munthe-Kaas, 2014; Binder et al., 2011), highlighting the emergence of a participatory form of experimentation at the local level. Often participation explicitly means the participation of citizens, but there are also examples of more limited urban experimentation with the focus on participation and partnerships with experts and the private sector (Westman & Castán Broto, 2018). According to Voytenko et al. (2016), urban living labs are seen as a form of collective urban governance and experimentation in order to addresses, among other goals, climate issues. Urban living labs are based on diverse forms of cooperation and partnerships, developing and testing new technologies, products, services, and ways of living to produce new solutions, for example, in attempting to tackle climate change (Evans & Karvonen, 2014). These living labs and experiments have also become increasingly popular in Finland, where several projects and studies have already been conducted (Antikainen, Alhola, & Jääskeläinen, 2017; Heiskanen et al., 2017; Heiskanen, Jalas, Rinkinen, & Tainio, 2015; Ruggiero et al., 2018).

Although these strands of literature have mainly empirically observed the emergence of experimentation in climate governance, and participatory experimentation has become more common, questions are being asked regarding their impact. Although there is an increasing amount studies evaluating them, coordinating efforts are largely missing (Luederitz et al., 2017). In addition, Voytenko et al. (2016) argue that there is no consensus in terms of what the role of urban living labs has been in terms of urban governance. It is yet unclear as to whether they present a new way of engaging urban stakeholders with new forms of participation, collaboration, and experimentation and learning. Also, Kivimaa et al. (2017) state that future research needs to clarify what the successes and shortcomings of climate governance experiments are, what the relationships to existing policy are, and what the long-term aggregate evaluations of experiments tell us about their benefits.

2.2 | Analytical framework

This study applies a framework based on three themes that emerge from the literature and have previously been used in assessing projects based on experimentation (Berg, Hildén, & Lahti, 2014; Binder et al., 2011). These three themes are learning, participation, and public debate, and they are at the center of understanding how participatory experimentation is taking place. Whether this experimentation is then able to challenge existing structures, that is, rules, norms, and practices, is a crucial question (Berg et al., 2014, pp. 28–29). The three above-mentioned themes—learning, participation, and public debate—can, in theory, open new pathways and contribute to structural changes, and the role of new ways of thinking and doing are crucial in sparking off systemic change, that is, transitions (Geels & Schot, 2007; Hildén, Jordan, & Huitema, 2017; Hodson & Marvin, 2010). As a result of examining our case through these three aspects, we further review the changes induced by individual experiments within the project, as well as potential further reaching structural changes as an outcome of the Climate Street project as a whole.

2.3 | Testing and learning

According to Berg et al. (2014, pp. 23–25), learning is one of the central purposes of experimentation as they provide opportunities for learning, particularly when ideas become realized and implemented. At its simplest, learning in these instances has been defined as "a process of iterative reflection that occurs when we share our experiences, ideas and environments with others" (Keen, Brown, & Dyball, 2005, p. 4). With regards to strategic niche management, Heiskanen et al. (2017) observe a distinction in the literature between the techno-scientific and cognitive dimensions of learning and situated learning. The former is considered to be more related to the need for aggregation of lessons learned in local experiments, whereas the latter is more interested in the development of participants' tacit and embodied skills and confidence (Heiskanen et al., 2017).

More specifically, we consider learning to consist of three interlinked processes: "deepening (learning as much as possible from the transition experiment), broadening (repeating an experiment in an adjusted form in a different context) and scaling-up (embedding an experiment in the existing structures of the incumbent regime)" (Grin, Rotmans, & Schot, 2010, p. 146; Holm, Stauning, & Søndergård, 2011). When applied to the assessment of this project, there are three particular areas that are examined. First, we look at project participants' experiences, and lessons learnt as part of the project, related to the "deepening" aspect of learning. Second, we look at the learning process among the project team members, and finally, we estimate the impact of the learning process with respect to the project's goal of sustainable development, which is connected to the "broadening" aspect of learning. The projects itself did not address scaling-up as one of its tasks, but we will reflect on that, although our empirical material does not allow us to fully analyze it.

2.4 | Participation

Participation is also considered a central feature of experimentation (Berg et al., 2014, pp. 25–26). Participation is a key feature of the different types of partnerships formed in terms of experimentation (Westman & Castán Broto, 2018). The level of participation in experiments has been seen to depend on the type of experiment in question (Caniglia et al., 2017). Previous research on climate experiments has shown that experiments can be work when they are based on territorial rootedness, leveraging different actors' experiences, facilitating interaction between them and treating them as experts in their respective fields (Cloutier et al., 2015). Public acceptance and participation are also key in managing the expectations of the public in

experiments (James, 2011). In this study, we assess the participation process from the perspective of the target groups (citizens and local entrepreneurs) as well as from the perspective of the project team.

2.5 | Public debate

Berg et al. (2014, pp. 27–28) argue that a significant contribution of experiments is their role in bringing issues to public debate. They help raise awareness of particular issues and make them known to larger audiences. Experiments also allow for a certain level of simplification of complex themes that makes them approachable, and they can also create symbols and narratives that become shared for a wider group of participants (Bulkeley & Castán Broto, 2013; Holm et al., 2011; Seyfang & Smith, 2007). Public debate can also facilitate between the strategies that guide developments by connecting them with the challenges noted at the local level (Hodson & Marvin, 2010). In the Climate Street project, public debate took place on two levels, and we consider both in this study. First, we assess the attention in traditional media (newspapers, TV, and radio) and in social media. Second, we assess, in how far the project gained the attention of the people living and working in the target areas.

3 | CASE STUDY AND METHODOLOGY

3.1 | Climate street Helsinki and Vantaa

There has been increased interest in experimentation within energy policy sector in Finland recently (Kivimaa et al., 2017), as well as in terms of smaller scale projects (Antikainen et al., 2017; Ruggiero et al., 2018). This study is based on the Climate Street Project in Helsinki and Vantaa. The project lasted from September 2015 to June 2017.1 The main objective of the project was to contribute to both cities becoming carbon neutral, and aid in the adaptation efforts to impacts of climate change (Seppälä et al., 2017). The project's aim was to build a strong base for participation since the efforts of the city administrations' themselves will not be able to guarantee a transition to low carbon cities, even if the city administration's own activities are carbon neutral. The project was conceptualized from the beginning as a spatially specific area, where a number of different stakeholders, including citizens, businesses, and the city administration would be able to experiment with low carbon services, products and platforms, as well as consider adaptation to climate change. These experiments would include technology-oriented pilots, as well as social innovations, geared toward changing everyday behaviors of citizens on the streets. The climate objectives of the project are thus combined with developing business opportunities, improving the liveability of the target areas and wider sustainability ideas. The aim was to create a reference point to climate friendly development in an already existing urban environment in order to then help scale-up these experiences.

The Climate Streets were located in cities in Helsinki and Vantaa, Iso Roobertinkatu and Tikkuraitti, and Asematie, respectively. The streets were chosen by the cities, because they were both classified as pedestrian streets and they were both considered for extensive renovations at the time when the project plan was being formulated. More specifically, the climate street in Helsinki is located in the urban core of Helsinki with most buildings on the street being listed. The streets in Vantaa are somewhat different in profile, with being more hubs for regional transportation and shopping.

Overall, 52 different kinds of experiments and events were organized in the streets during the project period, see the Supporting Information of this article and the already published assessment report for more details (Seppälä et al., 2017). These varied greatly in nature, with some being one off occasions and others being continuous activities that lasted throughout the project period. In terms of the thematic foci of the experiments, all were related to climate change, addressing issues such as energy efficiency, renewable energy, sustainable transformation, reduction of waste, adaptation to climate impacts, sustainable food and consumption, for example. The project team was involved in all the activities together with other stakeholder groups, including residents, citizens, business owners, building managers, school children, and city officials from across the city departments.

3.2 | Methodology

This article is based on an assessment carried out as part of the Climate Street project, presented as a case study (Stake, 1995). The authors were involved from the project planning to implementation as projects partners, by providing not only simultaneous feedback to project partners but also carrying out an assessment of the project at the end of the project period. The researchers were not involved in the implementation of experiments but documented activities during the project.

In terms of the data used, this study relies on multiple sources. First, participant observation (Kawulich, 2005; Waddington, 2004) was used throughout the 3-year project period. Researchers were involved in project meetings and activities and made extensive notes and observations. The researcher limited their interference in project activities to a minimum, but it was the researchers' responsibility to provide feedback based on their observations. Second, several questionnaires were prepared for project participants during the project. Third, semistructured interviews (Denscombe, 2014) were carried out several times during the project period. First round of interviews (n = 6) was conducted during the first months of the project period, and the interviewees included the project staff who were planning the project. During the final months of the project, two further rounds of semistructured interviews were conducted. This included interviews (n = 20) with the project staff, street residents, and building owners, as well as businesses owners on the streets, lasting from 10 min to an hour. In addition, shorter interviews (n = 10) were conducted with participants in the climate street events, which lasted

from 8 to 20 min. Finally, this study also utilizes secondary material, including documentation and material produced by project participants, project documents, presentations, and feedback forms gathered by the project team in various events during the project period (Table 1 summarizes the empirical material). The interview data were transcribed and organized in Atlas.ti qualitative analysis software. Furthermore, the data were coded and analyzed thematically (Ritchie & Spencer, 2002) based on the four categories presented above in Section 2.2.

There are some limitations with regard to the applied methodology. First of all, assessing the impact of experimentation has been considered to be challenging, especially when it takes place during and immediately after the project in question (Kivimaa et al., 2017). It is possible that tangible and intangible benefits of the project manifest after the project duration and after the period when the data have been collected. Also, the short duration of the project itself poses challenges to estimating whether the project itself had an impact on the street or the city in a wider perspective, hence making it hard to capture the impact of the project outside of the geographical boundaries of the experiment itself. To estimate the project's impact, the authors had to rely on the answers of the interviewees and project documentation, treating them as key informants of the process. Some indicative numbers were available for the reduction of carbon footprints but their scope was too narrow, which posed limitations to their use for research purposes.

TABLE 1 Empirical material collected for this study

Material	*N*	Analysis
Interviews		
Interviews with project staff at the beginning of the project	6	Thematically analyzed, results presented in Section 4
Interviews with project staff, street residents, building owners, as well as businesses owners on the streets at the end of the project	20	
Short interviews with participants in events	10	
Media		
Newspaper articles	10	Quantitatively presented as part of Section 4
Blog posts and municipal news	20	
TV news	1	
TV news portal articles	6	
Articles in professional journals	7	
Radio interviews	1	
Other material		
Feedback forms (number of answers)	18	Content analysis presented in Section 4
Minutes of project meetings	30	

4 | RESULTS

4.1 | Testing and learning

When it comes to the learning of various project participants and stakeholders, a number of issues can be observed. Many of the experiments showed that learning took place at the level of absorbing new information, which can be considered to be rather unambitious and not reflected in project's goals (this was supported, e.g., by Initiatives 5, 7, 8, and 17 in the Supporting Information). A typical comment by the interviewees would be:

> My general knowledge about climate and environmental issues improved enormously. (Climate-Street resident)

Interestingly, in experimentation, failure tends to be closely associated with the learning process in that it supports the development of new alternatives afterwards. However, for many of the citizens and local businesses, a failure of an experiment was often not a viable option and this resulted in the experiment being less popular to begin with. Many participants would not join an experiment if they considered the economic risk or the risk of other negative consequences too big. When talking about heat recovery (a measurement to reduce energy consumption for heating), one of the shop-owners stated:

> This is a fairly big operation. Do we get a comparable benefit in an adequate repayment period, if we take into account the construction and maintenance costs? The current assumption is that we won't. So this is something that drops off from the list of investments. (Climate-Street entrepreneur)

If there was a clear vision of being able to accrue economic benefits, residents and business owners were more eager to join experiments planned within the project. As a consequence of this, the uptake and spread of already tested innovations was considered in many ways easier than testing new innovations with no proven track record as they were considered to be riskier. Often, learning for the participants meant receiving new information and knowledge rather than testing innovations or experiments, which included a behavioral change that was required from the participants. Thus, for example, the introduction of energy saving technical devices was easier than the testing of alternative business ideas for shop keepers (see e.g., Experiments 4, 20, 26, 34, 39, and 46 in the Supporting Information).

For the project team, social learning appeared to happen on several levels. Examples of social learning can be seen to happen in the engagement with the target groups. As experimentation is a fairly new concept and an approach for the city administration, it was crucial to identify the needs of the target groups and to establish trust between project participants. This created challenges to the project team and also demanded many resources in the beginning, which

perhaps had not been taken into account when the project was planned. This was confirmed by the interviewees for both locations of the project, Iso Roobertinkatu in Helsinki and Tikkuraitti in Vantaa:

> We went around to all the shops in the pedestrian street several times. And [my colleague] did a tremendous job contacting the boards of all the apartment buildings. This is absolutely pivotal. And it takes some time for them to chew and digest the things that we could offer. (Project team representative, Helsinki)
>
> That we got things rolling and got something done with each of the target groups, this was quite a bit, it needed a lot of time. (Project team representative, Vantaa)

A second strand of learning concerned the collaboration with other departments of the city administration and the ways in which to get them involved in the project and to be receptive to new ideas that could challenge established decision-making procedures. Given the spatial limitation of the project, many of the cities' administrations and agencies were also "present" on the streets, while not necessarily engaging with the project. This meant that the project team also had to create, convince, and maintain working relationships with multiple agencies throughout the project period, as many of the proposed experiments cut across the administrative power of one or more agencies. This also influenced the experiments, as on more than one occasion, some agencies declined permits for them, citing that no exceptions can be given to individual streets in the city center. An example of this was, an electric vehicle charging station that was planned to be installed on to the climate street in Helsinki (discussed several times in project meetings, but not realized in an actual experiment).

> One case was, that there would be a shared electric van. But it got complicated because we didn't get the city's permission to set up a charging station on the street. Or you can put there a charging station, but according to the city you can't reserve it for one operator only. (Project team representative, Helsinki)

Finally, the alignment of the project's and the target groups' time frames and expectations toward the project contributed to the learning within the project. Although for the project team sustainable development and a reduction in greenhouse gas emissions were at the heart of the agenda, for many shop keepers, urgent everyday issues pushed these issues off the agenda, despite them being generally favorable to these ideas in principle. This highlights the need to understand the temporal aspects of experimentation. The project group perceived failure as a possibility and beneficial for the learning process, but this was not considered an option for participants, shop owners in particular.

> The atmosphere [in the project] was good. But when you run your business with maybe one or two employees, it is difficult to break out and start developing your business in a new direction. (Project team representative, Helsinki)
>
> The shops are small, the restaurant, their employees. They are so busy that they maybe didn't find the time to get excited and to develop this business. (Project team representative, Helsinki)

4.2 | Participation

Participation was considered crucial in engaging the citizens and businesses on the streets. When planning experiments, the project team was clear in terms of the target audiences and the type of participation that was considered to be most helpful for each of the target groups. Low-threshold events in terms of participation were important in creating contact with residents and citizens and engage them in the project's goals. These included, for example, the participation in Earth hour events held on the streets, offering vegetarian and climate-friendly food on the streets, providing information and knowledge during other events on the streets in Helsinki and Vantaa. In addition, information events about energy efficiency and solar power or a free breakfast for cyclists reached a broad audience (Initiatives 6, 9, 10, 12, 15, 16, 23, 42, and 45 in the Supporting Information).

> And then we had these public events, where we tried to get the message through. They were by and large quite successful. (Project team representative, Vantaa)

In addition to these information sharing activities, there were activities that required the development of a stronger involvement of the target groups. Engagement of target groups was generally considered positive and it was primarily realized with those possessing a readily positive attitude toward environmental issues. This was confirmed by several participants in the feedback questionnaire and interviews:

> Sure, it made us think differently about certain things. On the other hand, many things had been already quite clear and straightforward. (Participant of the personal trainer programme)

These activities included, for example, the calculation of carbon footprints for several properties on the streets, the calculation of the solar power potential for 11 buildings, a personal climate trainer program, the establishment of a support group for the chairpersons of building associations, or a workshop to develop climate friendly business models (Initiatives 11, 14, 20, 25, and 32 in the Supporting Information). Here, the project team cultivated cooperative relationships that were necessary for the experimentation to be succeed, that is, without the participation of citizens, businesses, or building managers, the outcome of the experiments would have been negative.

In general, the knowledge generated in these activities was well received. However, substantial and lasting or permanent behavior changes triggered, for example, by the personal climate trainer program, were difficult to trace within the project lifetime. Also, for many activities, it was questionable how they would continue beyond the project lifetime, if the project team members could not act as facilitators once the project came to an end. Many respondents asked about the project's continuation in the feedback questionnaire and also interviewees pointed to the limited duration of the project:

> Maybe this will be still remembered next year. But if there are no active persons or something more continuous… I don't think that people will remember much or that there will be a visible impact, for example, in five years from now. (Climate-Street entrepreneur)

There were some examples of participation leading to a change. For example, the support group for building association chairpersons was established in the beginning of the project to facilitate open discussion on issues such as energy efficiency and renovations on the street between different buildings, each represented by their own association's chairperson. This group has continued its activities and attracted new members after the project, generating new forms of collaboration on the street.

There were also consultation events for larger scale projects related to the refurbishment of the streets in Helsinki and Vantaa that were held on the streets during the project period. These events received mixed feedback, as many participants felt that their suggestions and ideas did not have much influence on the city's planning activities and that plans had already been developed and participation was only nominal. Nevertheless, representatives felt that the Climate Street project reduced the gap between city administration and citizens, which is often seen as a significant barrier.

The counterpart to the citizens' and businesses' participation was the engagement and involvement of other city departments, municipal actors, in the project in so far as it was needed for the project to be carried out. The project team experienced various challenges in this task. First, different departments prioritized the objectives of the project differently, leading to a situation where there was no shared vision initially. Depending on the department, the focus of the project was on sustainable development, or alternatively on economic possibilities or its focus was on improving the liveability of the target streets in Helsinki and Vantaa.

> The city [administration] is at least as complicated as the street itself. We also have conflicting interests that we push forward. And in this case, the representatives that push things in different directions can be even in the same project. But that's how it is. This is not necessarily a very rational ensemble. (Project team representative, Helsinki)

Second, city departments were varied in terms of their openness toward innovative approaches. Whereas some departments relied heavily on existing rules and procedures, and distribution of responsibilities with little interest in diverging from them, others were more open to test new arrangements and ways of doing things.

> When you find the right person, things can also go smoothly. But when somebody says "no" and you're getting nowhere, you should go on and ask somebody else, because maybe things can still go on and succeed. (Project team representative, Helsinki)
>
> I guess, at least in the beginning in their [the project team's] opinion, we were quite strict. Like: this won't work out. But I think that the attitude was that we try to make it happen; that we really get functional and long-lasting solutions. But sure, we tried everything that we can do. (City department representative)

Connected to this is a third point that it is a slow and tedious process to change existing administrative procedures. Of the two cities, this was more pronounced in Helsinki than in Vantaa, which might be related to the administrative culture but also to the size of the cities and their respective administrations. The city of Helsinki is one of the biggest employers in the country; whereas Vantaa's organization is smaller and more adjustable, according to the interviewees. There were also several cases where the same issue was judged very differently by different persons within the same department or authority. For example, a barrier that could be lowered to regulate car traffic to one of the pedestrian streets was considered technically not feasible throughout the project (according to the minutes this was discussed on several occasions). Only at a very late stage, a new city representative reconsidered its feasibility and this type of barrier was integrated into the refurbishment concept of the street. These challenges reflected back onto the participation of both citizens and businesses. If these groups perceived the city's administration as inflexible and static, it had a negative influence on their participation.

4.3 | Creation of public debate

Media attention was an important element in the project, as increased visibility has been shown to improve the impact of projects such as the Climate Street. Here, messaging through different media worked as a channel to distribute the information and knowledge gained in the project. Additionally, outward communication helped to make the project recognizable and to provide a frame for the diverse activities within the project. Overall, the project gained some attention in traditional media (see Table 2 for an overview), as well as in professional magazines with the most successful experiments being highlighted. The fitting of solar panels to an old apartment house gained the most attention (mentioned 15 times), but also the calculation of carbon footprints and energy saving suggestions (mentioned 10 times) were noticed as examples of how climate issues cut across every-day life and what simple solutions can be achieved by making informed choices every day. However, many small-scale initiatives that were attractive for the residents and shop-keepers stayed below the

TABLE 2 Social media channels of the project and visitors and followers (counted June 21, 2017; Seppälä et al., 2017)

Source	Visitors/followers
www.ilmastokatu.fi	5,658 individual visitors (September 1, 2015 to June 21, 2017)
Facebook	465 followers, 466 likes
Twitter	485 followers
Instagram	168 followers
YouTube	2–273 views per video

media-radar and were not picked up beyond those who were directly involved in the activities.

The use of social media proved to be a suitable way of spreading project information. The project had its own webpage (www.ilmastokatu.fi), Facebook, and Twitter account, and project activities were also visible on Instagram and YouTube. Nevertheless, the attention on social media (i.e., the number of followers) stayed well below the number of the line organization, that is, the permanent city organizations and their social media accounts (see Table 2). This is not necessarily surprising because projects are more transient in nature, while city departments regularly use their accounts to inform residents.

Quite some time was spent on identifying the different target groups, although this did not always lead to positive outcomes. Generating a broader discussion and debate among residents and local businesses was not always easy. Our interviews indicate that many people in the target areas knew very little or nothing about the Climate Street project, despite the project's participation in many public events on the street for 3 years.

> Sure, it is visible now. There are big signs. But when you talk to the people and somebody has to guess what that is. It can still be a big question mark, what is the ClimateStreet? (ClimateStreet entrepreneur)

However, the project did help to generate discussion within building associations, for example, about the possibilities for photovoltaic energy sources in older residential buildings. According to our interviews, there were doubts as to whether it was allowed, or profitable, and the project helped to overcome these questions. Also, Climate Street window stickers were used to communicate not only the project's objectives, but also climate friendly services and products of local businesses (Initiatives 26, 28, 29, 41, 45, and 46 in the Supporting Information). These were well-received and helped to communicate and make the project more visible in the streets.

4.4 | Results of experiments: change of structures and behavior

Throughout the project, changes mostly became tangible at a technical and hands-on level. Also, project activities that were connected to already ongoing trends were most likely to work. For example, the mapping of solar power potential and the installation of photovoltaic panels on one of the buildings, as well as the introduction of vegetarian and vegan dishes at local restaurants, are exemplary activities for which there was broader societal support than just from the project. Trainings and the provision of knowledge and information certainly raised environmental awareness (as far as the project managed to facilitate learning and create public awareness), but the results were not yet visible at the end of the project. This problematic has also been identified in previous literature, also making the assessment of living labs rather challenging (Luederitz et al., 2017). A separate study reports that the carbon footprint for participating building associations and businesses dropped by 3 and 9%, respectively, when these were addressed by project measures (Green Building Council Finland, 2017; Initiative 1 in the Supporting Information). This can indicate that the experiments had some effect on the streets. However, it is not a significant reduction and one that could also partly result from activities outside the project.

City organizations and governance structures themselves can also be influenced by experiments. However, a more profound change in the physical structures and infrastructure of the city, as well as changes in standards and procedures, were very difficult to achieve within the project. Although the project was purposefully aligned with renovation activities of the street in both Helsinki and Vantaa, it can be argued that the project's impact remained marginal. This means that the project did not achieve significant changes in the physical space of the city.

> Let's put it this way: somehow the cityscape is holy. It's really difficult to affect the cityscape. You drift easily into areas, where you should not go. A lot has to happen there still. (Project team representative, Helsinki)

Also, when it comes to the city's governance structures, experiments and suggested new solutions could not bypass existing regulations and standards, closing down the opportunity for experimentation to change practices. For example, it was not possible to test intelligent, motion sensitive, street lights that would react to the use of the space, as opposed to standard street lighting. Similarly, listed buildings have restrictions with respect to the use of photovoltaic, as the installation of solar panels can radically change the outlook of the building. Furthermore, procurement regulations limited the consideration of environmental factors in the procurement and tender process, thus at times forcing the project to acquire services or products that were not the most climate friendly.

> It is a little bit of a disappointment that it is so difficult to influence the choice of materials. And in spite of all, the pavement was wrong in the end. We could not select the best, because the city hasn't found a way that allows tendering according to ecological criteria. (Project team representative, Helsinki)

As already mentioned, privately run charging station for electric cars could not be installed on public space, thus preventing the experimentation with electric vehicles. Although many inhibiting factors were identified, there are also some positive examples that emerged during the project: street lights could be changed to LED lights, a bicycle parking facility was built (Initiative 51 in the Supporting Information). And perhaps most importantly, most of the city representatives that participated in the project confirmed that the communication between different departments had improved during the project. This can be interpreted as a first step toward more substantial structural changes, which will most likely also support the on-going structural reforms of the city administrations that were taking place during the project duration.

5 | DISCUSSION

Overall, there are a number of enabling factors behind experiments that have been identified in the literature, including economic viability, public funding technological development, impact assessments, and public policies and regulation (Antikainen et al., 2017). These factors can also be identified in our case. Both the participation of multiple actors and learning can be seen to positively influence each other. Gaining meaningful exposure through media also helped to facilitate the experiments further and share the message. Positive impacts on all of these factors are expected to be associated with trust (among participants, project team members, and city representatives) and with political support for experimentation (Mees et al., 2019). Both trust and political support are slow to build and would have to be an a priory condition for the project rather than an outcome of it.

In terms of learning, our findings show that this was limited mainly to the deepening aspect, that is, acquiring more information about the project itself. Much of the project staff reported learning outcomes, as did project participants but these outcomes were not seen to be broadening out or scaling-up on their own. This lack of upscaling was most likely due to the fact that it was not an explicit aim of the project itself. Similar findings have been reported in Finland by Ruggiero et al. (2018). They show that learning and networking have tended to remain activities that are small, and not particularly strategy driven. Ruggiero et al., however, appear optimistic that more attention will be paid to this in the future, which may lead to more positive outcomes.

Communication and media, as shown previously (Heiskanen et al., 2017), have been shown to support the implementation of experimentation, supporting the learning and building legitimacy. In the Climate Streets, media visibility was seen as beneficial and some of the messages were targeted to specific actors. However, similarly to other cases (Heiskanen et al., 2017), the messaging tended to eventually fade out as main activities were concluded, or they resorted to a reporting format, with less focus on engaging stakeholders in a dialog.

The literature on experimentation and living labs sees learning, participation, communication, and changing existing structures and practices as enabling experimentation (Berg et al., 2014; Binder et al., 2011; Munthe-Kaas, 2014; Nevens et al., 2013). As also argued by Antikainen et al. (2017), funding, plurality of actors, and communication strategies can be both enabling and restricting at the same time. Our analysis of the Climate Street project shows a number of practical limitations that appear when we examine the interplay of these factors, as none of them alone can guarantee success of an experiment. Hence, while learning, participation, and challenging existing structures can nourish and support each other; these factors can also turn out to limit and restrict each other.

As a result, a type of negative spiral can be identified, particularly in cases where it appears that a failure of an experiment for many of the participants appears to be too risky, and thus participants choose to opt out. This in turn can limit experiments to those with a good chance of success, which then can limit the overall number of potential experiments. A smaller number of experiments can then limit the learning effect which can hinder the potential for further reaching change. Small-scale technical experiments with direct benefits for the participants tended to be popular, but this has less impact on wider practices or existing structures, as benefits were mostly accrued by those directly installing or using the technical innovation. These insights further stress the need to examine the roles that different participants have in experiments. The role of consumers in experimentation is not well known (Hansen & Coenen, 2015).

One of the challenges identified in the experimentation literature is the one of scaling-up, that is, to generate similar experiences elsewhere. It is clear that while experimentation can lead to rapid changes, procedures and standards in city administration are slow to change, particularly if the actors do not have good connections and networks to the existing regime (Antikainen et al., 2017). Previously, particularly those experiments that have been built by public authorities have tended to work, particularly if there is funding, good communication and contacts available (Antikainen et al., 2017).

Although these factors were identified in the Climate Street, it was argued that a project type of intervention can clash with existing networks and structures, demonstrating the place-specific norms and values that are embedded in the city (Hansen & Coenen, 2015). Although there was clearly some interest to scale-up, this effort required the project team to work hard in both directions: to engage with the target groups and to gain other city departments support for participatory and innovative experiments, which was time consuming and took time away from other activities, particularly there was no explicit goal in the project to do so.

Previous literature has identified the importance of policy and regulation as a factor in attracting activities related to climate and energy (Gibbs, 2006) and the central role that public authorities play in this. Thus, this could imply that a dedicated physical location for climate friendly experimentation, such as a climate street, would attract interest widely. Our findings also show that existing rules and practices, often those not climate related, can limit the potential for changes in the physical streetscape, which in turn feeds back into the motivation to participate in workshops and consultations.

This is related to the often-disconnected timelines of different ways of governing and developing the urban space, also noted by others (Heiskanen et al., 2017; Hildén et al., 2017). Experiments and living labs are designed as projects with limited lifetime and budget, leading to short-term interventions. Because changes in established practices happen slowly, the project only could open pathways to change, but little substantial change occured during it. Similarly to Hildén et al., 2017, we argue that the role legal aspects play in determining what is technically feasible and politically acceptable is an issue that requires further attention. There often is no a priori assessment of what can be achieved, leading to unrealistic aims during the project period.

According to Heiskanen et al. (2017), the deployment of new technologies often requires planning and permits between different branches of the city administration, leading to lengthy processes and delays. This can also be seen in our case, where the existing urban structure of the project's target areas further reinforced the influence of existing structures and procedures. For example, listed buildings have restrictions with respect to the use of solar power. To change the use of the street space is challenging, because most areas have a designated function already: restricting delivery traffic would result in the need for a loading area outside the project area. Rearranging garbage collection entails negotiations with many different (public and private) actors of the existing arrangement. New infrastructure solutions have to be integrated into the existing urban structures. Existing practices might be protected by the right of continuance. Exceptions for the project areas are not granted, because they could trigger unintended side-effects in other areas of the city. In these cases, the interfacing of the new and old physical structures can also evoke the collision of new process and established procedures and standards.

6 | CONCLUSION

The assessment of the impact of an on-going experimentation is methodologically challenging but also a necessity, as the speed for urban climate experimentation picks up pace. Based on participant observation and interview data, we can conclude that testing and learning deepened predominantly the understanding of those taking part in the experimentation. Communication was successful but mainly limited to the project period, fizzling out soon afterward. It is also notable that communication certainly sparked off a public debate within the streets but was often limited to those already engaged in the topic. As a result, the project itself had a limited impact in changing the behavior of individuals and business. In addition, existing regulation and rules and the existing physical landscape of the streets reinforced each other and put limits to the transformation that could be achieved within the project lifetime.

In the future, the continued emergence of experimentation as a form of governance is likely to continue to challenge more established forms of urban governance. In particular, these types of local initiatives have demonstrated the value of participatory experimentation and their potential in sparking off change. These types of initiatives can on the one hand facilitate change and enable non-public sector actors to engage in the low carbon transitions, particularly if participation of a multitude of actors is guaranteed. On the other hand, there are challenges in scaling-up from small-scale experiments, demonstrating the challenges associated with structural change, of which barriers can be harder to address. Although cities themselves have become vocal proponents of climate mitigation and stringent targets, it is clear that achieving those goals is not a straightforward matter (van der Heijden, Patterson, Juhola, & Wolfram, 2018; Wolfram et al., 2019). Therefore, further research and empirical studies should shed light on how different governance arrangements can enable and hinder the achievement of these targets and over what timescales.

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ORCID

Sirkku Juhola https://orcid.org/0000-0003-0095-2282
Johannes Klein https://orcid.org/0000-0003-0721-4063

ENDNOTE

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REFERENCES

Aiken, G. T. (2018). One-way street? Spatiality of communities in low carbon transitions in Scotland. *Energy Research & Social Science*, *36*, 129–137. https://doi.org/10.1016/j.erss.2017.09.028

Anguelovski, I., & Carmin, J. (2011). Something borrowed, everything new: Innovation and institutionalization in urban climate governance. *Current Opinion in Environmental Sustainability*, *3*(3), 169–175. https://doi.org/10.1016/j.cosust.2010.12.017

Antikainen, R., Alhola, K., & Jääskeläinen, T. (2017). Experiments as a means towards sustainable societies–lessons learnt and future outlooks from a Finnish perspective. *Journal of Cleaner Production*, *169*, 216–224. https://doi.org/10.1016/j.jclepro.2017.06.184

Bai, X., Roberts, B., & Chen, J. (2010). Urban sustainability experiments in Asia: patterns and pathways. *Environmental Science & Policy*, *13*(4), 312-325. https://doi.org/10.1016/j.envsci.2010.03.011 .

Berg, A., Hildén, M., & Lahti, K. (2014). *Kohti kokeilukulttuuria—Analyysi Jyväskylän resurssiviisaista kokeiluista strategisen kehittämisen työkaluina*. Helsinki: Suomen Itsenäisyyden Juhlarahasto.

Binder, T., Brandt, E., Halse, J., Foverskov, M., Olander, S., & Yndigegn, S. (2011). *Living the (codesign) lab*. Paper presented at the Nordic Design Research Conference, Helsinki. Retrieved from https://www.researchgate.net/profile/Eva_Brandt/publication/262036715_Living_the_codesign_Lab/links/004635399e7e8e46b1000000/Living-the-codesign-Lab.pdf

Bos, J. J., Brown, R. R., Farrelly, M. A., & De Haan, F. J. (2013). Enabling sustainable urban water management through governance experimentation. *Water Science and Technology*, *67*(8), 1708–1717. https://doi.org/10.2166/wst.2013.031

Boyd, E., & Ghosh, A. (2013). Innovations for enabling urban climate governance: Evidence from Mumbai. Environment and Planning C: *Government and Policy*, *31*(5), 926-945. https://doi.org/10.1068/c12172.

Broto, V. C., & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change*, *23*(1), 92-102. https://doi.org/10.1016/j.gloenvcha.2012.07.005.

Bulkeley, H. (2005). Reconfiguring environmental governance: Towards a politics of scales and networks. *Political Geography*, *24*(8), 875–902. https://doi.org/10.1016/j.polgeo.2005.07.002

Bulkeley, H., & Castán Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers*, *38*(3), 361–375. https://doi.org/10.1111/j.1475-5661.2012.00535.x

Bulkeley, H., Castán Broto, V., & Maassen, A. (2011). Governing urban low carbon transitions. In H. Harriet Bulkeley, V. Castán Broto, M. Hodson, & S. Marvin (Eds.), *Cities and low carbon transitions* (pp. 29–41). New York: Routledge.

Caniglia, G., Schäpke, N., Lang, D. J., Abson, D. J., Luederitz, C., Wiek, A., … von Wehrden, H. (2017). Experiments and evidence in sustainability science: A typology. *Journal of Cleaner Production*, *169*, 39–47. https://doi.org/10.1016/j.jclepro.2017.05.164

Castán Broto, V., & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change*, *23*, 92–102. https://doi.org/10.1016/j.gloenvcha.2012.07.005

Chu, E. K. (2016). The governance of climate change adaptation through urban policy experiments. *Environmental Policy and Governance*, *26*(6), 439–451. https://doi.org/10.1002/eet.1727

Cloutier, G., Joerin, F., Dubois, C., Labarthe, M., Legay, C., & Viens, D. (2015). Planning adaptation based on local actors' knowledge and participation: A climate governance experiment. *Climate Policy*, *15*(4), 458–474. https://doi.org/10.1080/14693062.2014.937388

Corfee-Merlot, J., Cochran, I., Hallegatte, S., & Teasdale, P. (2011). Multi-level risk governance and urban policy. *Climatic Change*, *104*(1), 169–197. https://doi.org/10.1007/s10584-010-9980-9

Denscombe, M. (2014). *The good research guide: For small-scale social research projects*. London: McGraw-Hill Education.

Dent, C. M., Bale, C. S. E., Wadud, Z., & Voss, H. (2016). Cities, energy and climate change mitigation: An introduction. *Cities*, *54*, 1–3. https://doi.org/10.1016/j.cities.2015.11.009

Evans, J., & Karvonen, A. (2014). Give me a laboratory and I will lower your carbon footprint!—Urban laboratories and the governance of low-carbon futures. *International Journal of Urban and Regional Research*, *38*(2), 413–430. https://doi.org/10.1111/1468-2427.12077

Evans, J. P. M., Karvonen, A., & Raven, R. (Eds.). (2016). *The experimental city (Routledge research in sustainable urbanism)*. London: Routledge.

Forrest, N., & Wiek, A. (2014). Learning from success—Toward evidence-informed sustainability transitions in communities. *Environmental Innovation and Societal Transitions*, *12*, 66–88. https://doi.org/10.1016/j.eist.2014.01.003

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, *36*(3), 399–417. https://doi.org/10.1016/j.respol.2007.01.003

Gibbs, D. (2006). Prospects for an environmental economic geography: Linking ecological modernization and regulationist approaches. *Economic Geography*, *82*, 193–215.

Gollagher, M., & Hartz-Karp, J. (2013). The role of deliberative collaborative governance in achieving sustainable cities. *Sustainability*, *5*, 2343–2366. https://doi.org/10.3390/su5062343

Green Building Council Finland. (2017). Ilmastokadun rakennusten hiilijalanjäljessä pienenemisen merkkejä. Retrieved from https://figbc.fi/ilmastokadun-rakennusten-hiilijalanjaljessa-pienenemisen-merkkeja/

Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to sustainable development: New directions in the study of long term transformative change*. New York: Routledge.

Hansen, T., & Coenen, L. (2015). The geography of sustainability transitions: Review, synthesis and reflections on an emergent research field. *Environmental Innovation and Societal Transitions*, *17*, 92–109. https://doi.org/10.1016/j.eist.2014.11.001.

Haughton, G., Allmendinger, P., & Oosterlynck, S. (2013). Spaces of neoliberal experimentation: Soft spaces, postpolitics, and neoliberal governmentality. *Environment and Planning A*, *45*(1), 217–234. https://doi.org/10.1068/a45121

Hausknost, D., Haas, W., Hielscher, S., Schäfer, M., Leitner, M., Kunze, I., & Mandl, S. (2018). Investigating patterns of local climate governance: How low-carbon municipalities and intentional communities intervene in social practices. *Environmental Policy & Governance*, *28*(6), 371–382. https://doi.org/10.1002/eet.1804

Heiskanen, E., Hyvönen, K., Laakso, S., Laitila, P., Matschoss, K., & Mikkonen, I. (2017). Adoption and use of low-carbon technologies: Lessons from 100 Finnish pilot studies, field experiments and demonstrations. *Sustainability*, *9*(5), 847. https://doi.org/10.3390/su9050847

Heiskanen, E., Jalas, M., Rinkinen, J., & Tainio, P. (2015). The local community as a "low-carbon lab": Promises and perils. *Environmental Innovation and Societal Transitions*, *14*, 149–164. https://doi.org/10.1016%2Fj.eist.2014.08.001

Héritier, A. (2001). New modes of governance in Europe: Policy-making without legislating? In A. Héritier (Ed.), *Common Goods: Reinventing European Integration Governance* (Vol. 2001/14). Bonn: Max-Planck-Projektgruppe Recht der Gemeinschaftsgüter.

Hildén, M., Jordan, A., & Huitema, D. (2017). Special issue on experimentation for climate change solutions editorial: The search for climate change and sustainability solutions—The promise and the pitfalls of experimentation. *Journal of Cleaner Production*, *169*, 1–7. https://doi.org/10.1016/j.jclepro.2017.09.019

Hodson, M., & Marvin, S. (2010). Can cities shape socio-technical transitions and how would we know if they were? *Research Policy*, *39*(4), 477–485. https://doi.org/10.1016/j.respol.2010.01.020

Holm, J., Stauning, I., & Søndergård, B. (2011). Local climate mitigation and eco-efforts in housing and construction as transition places. *Environmental Policy and Governance*, *21*(3), 183–198. https://doi.org/10.1002/eet.569

Jalas, M., Hyysalo, S., Heiskanen, E., Lovio, R., Nissinen, A., Mattinen, M., … Nissilä, H. (2017). Everyday experimentation in energy transition: A practice-theoretical view. *Journal of Cleaner Production*, *169*, 77–84. https://dx.doi.org/10.1016/j.jclepro.2017.03.034

Jordan, A., Wurzel, R. K., & Zito, A. (2005). The rise of 'new' policy instruments in comparative perspective: Has governance eclipsed government? *Political Studies*, *53*(3), 477–496. https://doi.org/10.1111/j.1467-9248.2005.00540.x

Kawulich, B. B. (2005). Participant observation as a data collection method. *Forum Qualitative Social Research*, *6*, 43. https://doi.org/10.17169/fqs-6.2.466

Keen, M., Brown, V. A., & Dyball, R. (Eds.). (2005). *Social learning in environmental management: Towards a sustainable future*. London: Earthscan.

Kivimaa, P., Hildén, M., Huitema, D., Jordan, A., & Newig, J. (2017). Experiments in climate governance–a systematic review of research on energy and built environment transitions. *Journal of Cleaner Production*, *169*, 17–29. https://doi.org/10.1016/j.jclepro.2017.01.027

Knieling, J. (Ed.). (2016). *Climate adaptation governance in cities and regions: Theoretical fundamentals and practical evidence*. Chichester: John Wiley & Sons.

Kooiman, J. (Ed.). (1993). *Modern governance: New government-society interactions*. London: SAGE.

Landauer, M., Juhola, S., & Klein, J. (2019). The role of scale in integrating climate change adaptation and mitigation in cities. *Journal of Environmental Planning and Management*, *62*(5), 741–765. https://doi.org/10.1080/09640568.2018.1430022.

Lockwood, M., Davidson, J., Curtis, A., Stratford, E., & Griffith, R. (2010). Governance principles for natural resource management. *Society and Natural Resources*, *23*(10), 986–1001. https://doi.org/10.1080/08941920802178214

Luederitz, C., Schäpke, N., Wiek, A., Lang, D. J., Bergmann, M., Bos, J. J., & Farrelly, M. A. (2017). Learning through evaluation—A tentative evaluative scheme for sustainability transition experiments. *Journal of Cleaner Production*, *169*, 61–76. https://doi.org/10.1016/j.jclepro.2016.09.005

McCormick, K., Neij, L., Anderberg, S., & Coenen, L. (2013). Advancing sustainable urban transformation. *Journal of Cleaner Production*, *50*, 1–11. https://doi.org/10.1016/j.jclepro.2013.01.003

McPhearson, T., Parnell, S., Simon, D., Gaffney, O., Elmqvist, T., Bai, X., … Revi, A. (2016). Scientists must have a say in the future of cities. *Nature*, *538*, 165–166. https://doi.org/10.1038/538165a

Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., & Morrison, C. (2011). Adapting to climate change through local municipal planning: Barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*, *16*(8), 889–909. https://doi.org/10.1007/s11027-011-9301-2

Mees, H. L. P., Uittenbroek, C. J., Hegger, D. L. T., & Driessen, P. P. J. (2019). From citizen participation to government participation: An exploration of the roles of local governments in community initiatives for climate change adaptation in The Netherlands. *Environmental Policy and Governance*, *29*, 1–11. https://doi.org/10.1002/eet.1847

Meijerink, S., & Stiller, S. (2013). What kind of leadership do we need for climate adaptation? A framework for analyzing leadership objectives, functions, and tasks in climate change adaptation. *Environment and Planning C: Government and Policy.*, *31*, 240–256. https://doi.org/10.1068/c11129

Munthe-Kaas, P. (2015). Infrastructuring Public Sector Innovation: Challenging Municipal Work Practices in Copenhagen. *European Planning Studies*, *23*(8), 1588-1608. https://doi.org/10.1080/09654313.2014.941791.

Nevens, F., Frantzeskaki, N., Gorissen, L., & Loorbach, D. (2013). Urban transition labs: Co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, *50*, 111–122. https://doi.org/10.1016%2Fj.jclepro.2012.12.001

Ritchie, J., & Spencer, L. (2002). Qualitative data analysis for applied policy research. In A. M. Huberman & M. B. Miles (Eds.), *The qualitative researcher's companion* (Vol. 573, pp. 305–329). London: SAGE Publications.

Ruggiero, S., Martiskainen, M., & Onkila, T. (2018). Understanding the scaling-up of community energy niches through strategic niche management theory: Insights from Finland. *Journal of Cleaner Production*, *170*, 581–590. https://doi.org/10.1016/j.jclepro.2017.09.144

Sengers, F., Wieczorek, A., & Raven, R. P. J. M. (2016). Experimenting for sustainability transitions: A systematic literature review. *Technological Forecasting and Social Change*, *145*, 153–164. https://doi.org/10.1016/j.techfore.2016.08.031

Seppälä, A., Haanpää, S., Klein, J., & Juhola, S. (2017). *Ilmastokaduilla hiilineutraaleihin kaupunkeihin? Ilmastokatu-hankkeen arviointiraportti*. Espoo, Finland: Department of Built Environment, Aalto University.

Seyfang, G., & Smith, A. (2007). Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental Politics*, *16*(4), 584–603. https://doi.org/10.1080/09644010701419121

Stake, R. E. (1995). *The art of case study research*. London: Sage.

Uyarra, E., & Gee, S. (2013). Transforming urban waste into sustainable material and energy usage: The case of greater Manchester (UK). *Journal of Cleaner Production*, *50*, 101–110. https://doi.org/10.1016/j.jclepro.2012.11.046

van der Heijden, J., Patterson, J., Juhola, S., & Wolfram, M. (2018). Advancing the role of cities in climate governance– Promise, limits, politics. *Journal of Environmental Planning and Management*, *62*(3), 365–373. https://doi.org/10.1080/09640568.2018.1513832

Voytenko, Y., McCormick, K., Evans, J., & Schliwa, G. (2016). Urban living labs for sustainability and low carbon cities in Europe: Towards a research agenda. *Journal of Cleaner Production*, *123*, 45–54. https://doi.org/10.1016/j.jclepro.2015.08.053

Waddington, D. (2004). Participant observation. In C. Cassell & G. Symon (Eds.), *Essential guide to qualitative methods in organisational research*. London: SAGE.

Weiland, S., Bleicher, A., Polzin, C., Rauschmayer, F., & Rode, J. (2017). The nature of experiments for sustainability transformations: A search for common ground. *Journal of Cleaner Production*, *169*, 30–38. https://doi.org/10.1016/j.jclepro.2017.06.182

Wellstead, A., Howlett, M., Nair, S., & Rayner, J. (2016). "Push" dynamics in policy experimentation: Downscaling climate change adaptation programs in Canada. *Climate Services*, *4*, 52–60.

Westman, L., & Castán Broto, V. (2018). Climate governance through partnerships: A study of 150 urban initiatives in China. *Global Environmental Change*, *50*, 212–221. https://doi.org/10.1016/j.gloenvcha.2018.04.008

Wolfram, M., van der Heijden, J., Juhola, S., & Patterson, J. (2019). Learning in urban climate governance: Concepts, key issues and challenges. *Journal of Environmental Policy & Planning*, *21*(1), 1–15. https://doi.org/10.1080/1523908X.2018.1558848

James, O. (2011). Managing citizens'expectations of public service performance: Evidence from observation and experimentation in local government. *Public Administration*, *89*(4), 1419-1435. https://doi.org/10.1111/j.1467-9299.2011.01962.x.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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